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Are there more potentially inhabitable planets?

Astronomers have recently announced that a rocky planet named GJ667Cc, outside our solar system, is potentially inhabitable. It has water, a similar surface temperature as our earth, and absorbs about as much incoming light and energy as our earth does.

Chances are that it could support some form of life. To date, it is the fourth such potentially inhabitable planet, all of them outside our solar system.

Extrapolation

What is "habitable"? What are the criteria of habitability? In defining them, we go by what we know, and extrapolate from there.

And our Mother Earth serves as the model or guide. A planet, then, should have adequate water, energy sources, and conditions that would allow the assembly of complex organic molecules.

Stars are not habitable. The temperature and other conditions are too severe for any stable chemistry to occur. Hence planets are the more likely hosts for life. And in this, Earth is an excellent example. What all does it have?

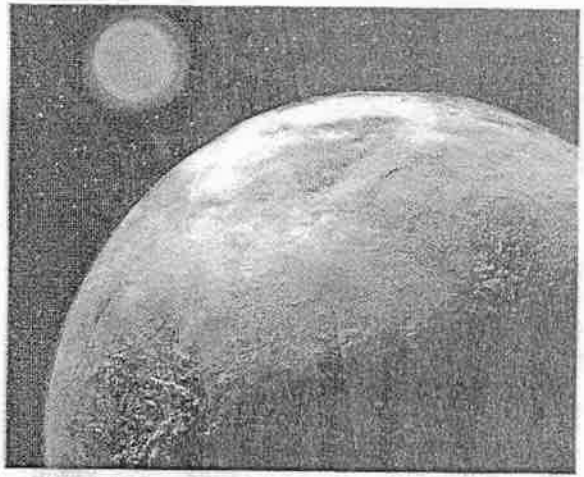
First, it is in the right place, orbiting the sun. The latter is a relatively stable source of energy for us; no major fluctuations or flares in heat, light or other types of radiation which can roast and burn off any life forms on planet earth.

In other words, our sun is a benign star, which offers the right type of energy for us. In looking for other potentially inhabitable planets, we need to look at where they are with respect to their suns.

Planet's weight matters

Next is weight. The planet cannot be too heavy nor too light; too heavy means too far from its sun and thus less energy. Also its atmosphere will be too thick; gravity will keep it too bound to the planet, making the surface too cold. Too light a planet is not that good either — not enough (if at all) an atmosphere not only will it be too cold but it will also be vulnerable for assault by meteors and high energy radiation.

Our Earth is just the right size. Not only is it able to hold a proper shield as its atmosphere, but its internal 'core' is also large enough to contain heavy metals, molten and providing a burning heat engine. This allows for geology to operate, providing plate tectonics, and an appropriate crust on the surface nourished by volcanic eruptions from the core. This churning has provided us on earth to have abundant amounts of crucial elements C, H, O, N, and P, and conditions suitable for life chemistry. Metals such as iron in the core make the orbiting earth a spinning magnet, protecting us from harmful cosmic radiation.



A CRITERION: *In looking for other potentially inhabitable planets, we need to look at where they are with respect to their suns.* – PHOTO: REUTERS

SPEAKING OF SCIENCE

Its size is right for orbiting the sun in a manner that we have a proper day-night cycle. Too long a cycle or too short would mean the temperature difference between day and night is either too long or too short.

And the orbit is better when it is circular and not too elliptical; if the eccentricity is too much, the day-night temperature differential could be too much to bear for the life forms on the planet. Mother earth is just a bit eccentric (just 0.02), not like many other extra-solar planets which are too eccentric to become hospitable.

Planets are spinning masses, and several of them tilt a bit around their spinning axis (just as a top does). It is this tilt that provides seasons.

Too little a tilt, there will be no seasons and too large a tilt, the seasons will be too extreme.

Neither is good for life forms to evolve and stabilize into a proper biosphere. Our Earth is just so tilted that it has allowed life forms to evolve and stabilize. Our moon too plays a role in stabilizing this tilt. An inhabitable planet should thus be expected to be of the right size, right eccentricity and right tilt.

A habitable planet should also be long-lived. Life of the type we know on earth has taken billions of years to evolve from the simple single-cell amoeba (3 billion years old) to us.

It is these combined properties of Mother Earth that has made her habitable. Thus in looking for other habitable planets, astronomers look for planets with similar properties. Mars, Venus, Saturn or Jupiter do not fit the bill.

No trace on Mars

Mars does (or did) have water and some chosen regions which might allow some life chemistry to happen, but so far there has been no indication of it. Going outside our solar system, GJ667Cc appears to be likely habitable.

How many more can be there? And will they support (have been supporting) not just amoebae but civilizations? Is there any such extraterrestrial intelligent life?

NASA had put together a program called Search for Extra Terrestrial Intelligence or SETI. Dr. Frank Drake had speculated that, in principle, there might be as many as 10 such. Others have brought that down to 2.3.

If there are, what do we tell them?

Even if there are only two other civilizations, how do we communicate with them, and in what language? Some have suggested sending signals of waves that are 21 centimeters in length, since that appears to be a universal radiation. If we can pulse it into an appropriate rhythm, perhaps some ETI would to know we are here.

But I like what the biologist Lewis Thomas wrote in his "Lives of a Cell". He says" "I would go for Johann Sebastian Bach, all of Bach, streamed out into space over and over again. We would be bragging of course but we can tell the harder truths later". I agree; a prosaic 21 cm radiation does not hold a candle to Bach (or Thyagaraja or Khusro). And we want them to know we are a civilization, after all!

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